



A Guide to Photo Monitoring

Effective land management depends on accurate documentation of environmental conditions and responses to management interventions. Memory and written records may not be able to capture the subtle, gradual transformations that can occur across landscapes over time.

Photo monitoring provides a systematic solution to these documentation challenges. This method employs repeated photography from established points to create a temporal record of landscape conditions. The resulting photographic time series enables both qualitative and quantitative documentation of environmental changes, including vegetation community shifts, erosion patterns, wildlife habitat modifications, and treatment effectiveness. The technique serves multiple management needs: establishing baseline conditions, tracking restoration trajectories, documenting regulatory compliance, and supporting adaptive management decisions. Photo monitoring data can be analyzed through various methods, from simple visual comparison to advanced image processing techniques. The standardized protocols ensure data quality and comparability while maintaining sufficient flexibility to address site-specific monitoring objectives.

Define Monitoring Objectives

Successful photo monitoring requires clearly defined objectives that drive all subsequent decisions about photo point placement, timing, and frequency. Without specific objectives, monitoring efforts risk collecting unusable or irrelevant data.

Common monitoring objectives fall into distinct categories:

- **Vegetation dynamics:** Documenting plant community succession, invasive species spread, or native species establishment
- **Treatment effectiveness:** Evaluating outcomes from mastication, prescribed burning, thinning, or herbicide applications
- **Disturbance recovery:** Tracking post-wildfire

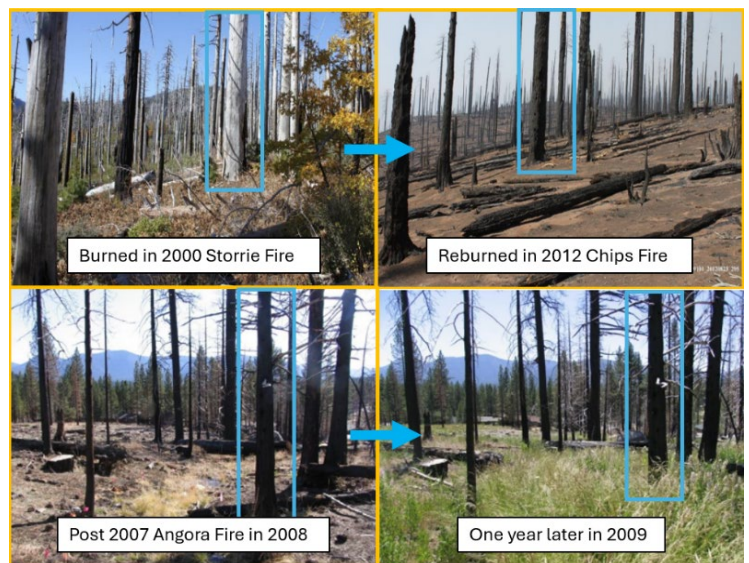


Image 1: From top left to bottom right. Blue boxes highlights a witness element for reference in each image. First row documents the vegetation change and burn severity following the Chips Fire in 2012. Second row captures changes in riparian vegetation in a drainage following the Angora fire [Credit: Ryan Tompkins and Susie Kocher]

regeneration, flood impact recovery, or drought stress responses

- **Physical processes:** Monitoring erosion rates, channel migration, or soil surface conditions
- **Infrastructure conditions:** Documenting fence lines, road conditions, or water development functionality

Each objective requires specific considerations for photo point design. Vegetation monitoring may necessitate seasonal timing to capture phenological stages, while erosion monitoring might require post-storm documentation. Treatment effectiveness often demands pre-treatment baseline photos with standardized follow-up intervals. For more information, see [UCANR Photo-Monitoring for Better Land Use Planning and Assessment](#).

Create a Standardized Protocol

Ensure consistency, repeatability, and clear documentation for photo monitoring via a standard protocol. Record this protocol via meta data and consider factors such as: when to photograph, how frequently to take photos, the duration of monitoring, and the appropriate times of year for photography.

Establishing Photo and Camera Points

A **camera point** marks a location where a camera is set up and can be a place where multiple photo points are taken. A **photo point** is an established location that **defines the orientation** of a camera located at a camera point. Care should be taken when establishing photo and camera points to ensure that the chosen points address the objectives. The following steps outline items for consideration and procedures for establishing photo points in areas selected for monitoring ([Hall, 2002](#)).

- 1. Identify a suitable site.** Select elements in the landscape for monitoring. For example, a hillside with a drainage to evaluate soil erosion. Find a **witness element**, like a unique tree, fence post, culvert, etc., that serves to (1) quickly locate the monitoring area and (2) as a reference point from which the camera and photo points can be located. Note the distance and direction from the witness element to the camera points.
- 2. Establish camera points, and orient photo points.** Select camera points capture the full scope, and from where multiple photo points, i.e. angles, can be photographed and not obstructed. Consider limiting bias, by taking a photo point in specific orientations, like a cardinal direction or set azimuth.
- 3. Mark photo and camera points.** Photo and camera points should be marked by both or with a physical marker (rebar, plot pole) and GPS location for future relocation (See [UCANR Mapping Forest Features](#) for more info).

Recording Photo-Point Metadata

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|---|---|
| 1. Standardized naming conventions for location and photo | 5. Timestamp |
| 2. Orientation of photo (Azimuth) | 6. Weather |
| 3. Equipment used (type of camera) | 7. Description |
| 4. Height of camera (Can be approximate i.e.. chest height or use a tripod to position the camera at a set height.) | 8. Treatment type, notable observations, points of interest |
| | 9. Photo taken by ____ |
| | 10. Any notes on changes in prior methodology |

Data Processing and Analysis

Organize and store images using consistent file naming and metadata databases.. If using a tablet or smartphone, consider using Survey123 APP or Avenza to create custom surveys or maps that integrate photos, GPS data, and notes.. Depending on the methodology (See table below), change detection in photo-monitoring involves employing comparison like before-and-after analysis or image processing tools.

Works Cited

- Hall, F. C. (2002). [Ground-based photographic monitoring](#). Gen. Tech. Rep. PNW-GTR-503. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- McDougald, N; Frost, W; Dudley, D. (2003). [Photo-Monitoring for Better Land Use Planning & Assessment](#).
- Satomi, R., Eggleton, C., & Butsic, V. (2024). [Forest Stewardship Series 26: Mapping Forest Features](#).

Photo Monitoring Methodologies				
Method	Overview	Applications	Advantages	Considerations
Traditional DSLR Cameras	Offers high-resolution images, greater control over aperture, shutter speed, and ISO	Suitable for detailed studies requiring high image quality	Superior image quality and versatility; able to use interchangeable lenses	Bulkier and requires knowledge of manual settings to maximize potential
Smartphone/ Tablet Cameras	High accessibility, convenience, and improving image quality depending on device	Suitable for quick documentation, accessibility to applications	Easy to use, and capable of capturing high-quality images; equipped with GPS for precise location tagging	Limited battery life, storage capacity, images may have lower resolutions
360-Photos	Captures panoramic images that cover the entire surrounding area from a single point	Monitoring large areas such as forests or open fields	Provides a holistic view, offering more context than traditional photos	Requires specialized cameras, may involve more complex data processing
UAV Imagery	Captures images from above, covering larger areas quickly and efficiently.	Larger areas, unreachable by foot	Provides high-resolution, creates imagery for geospatial analysis	High cost equipment and expertise in drone operation; regulatory compliance